

UK Patent Application (19) GB (11) 2 041 061 A

(21) Application No 7902819

(22) Date of filing

26 Jan 1979

(43) Application published

3 Sep 1980

(51) INT CL³ E05B 29/00

(52) Domestic classification
E2A LQ

(56) Documents cited

GB 940428

GB 924515

GB 815618

GB 408864

(58) Field of search

E2A

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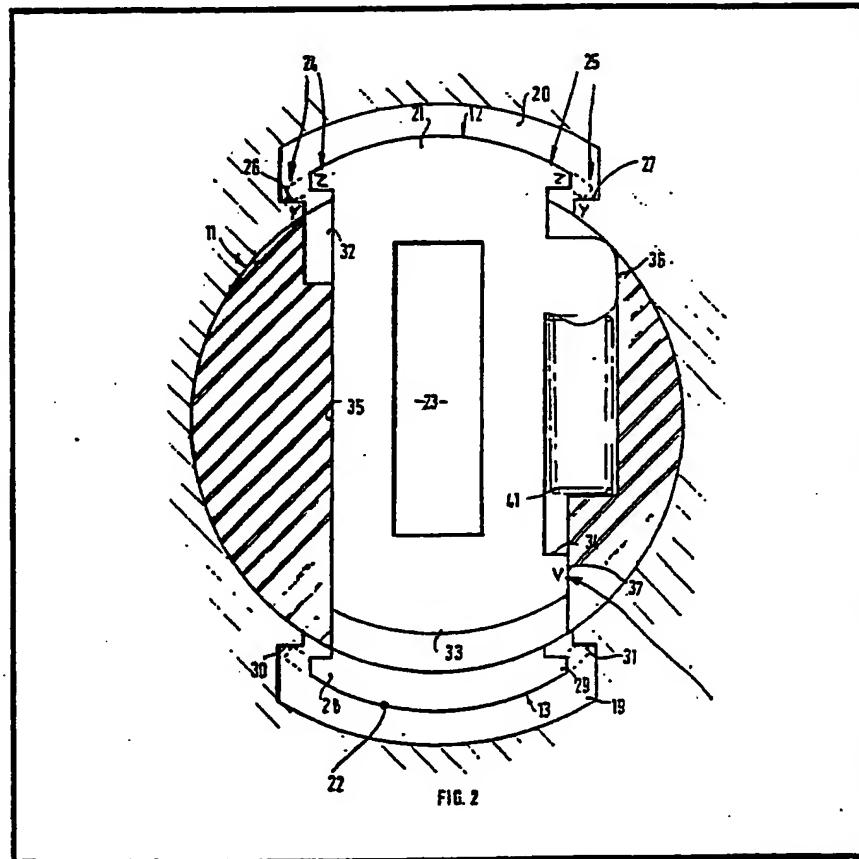
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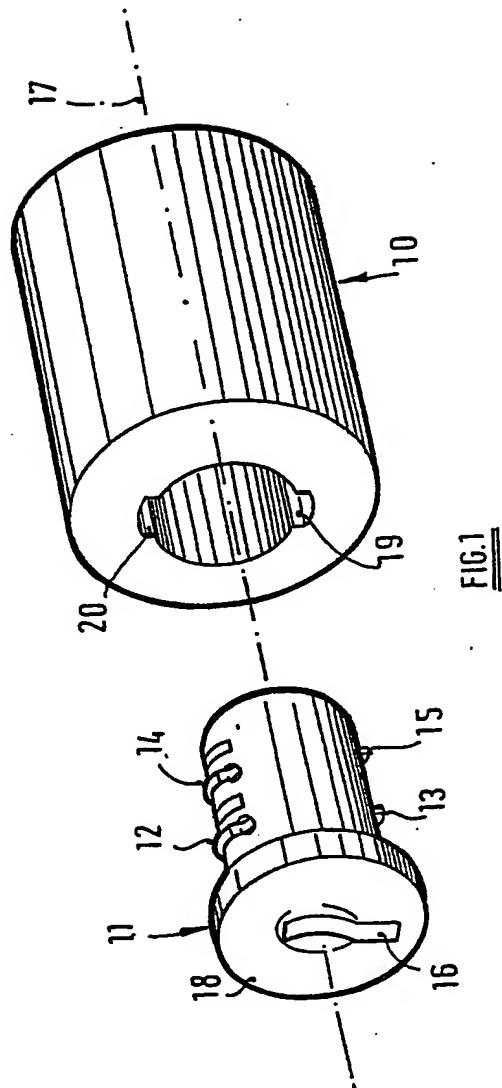
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(54) Barrel locks

(57) Tumblers of a plate tumbler barrel lock have projecting flanges 24, 25, 28, 29 which engage in an undercut groove 26, 27, 30, 31 formed in the tumbler housing so that the tumbler is held in the tumbler housing if torque is applied to the barrel during an attempt to pick the lock. There is a tapered locating tumbler (Fig. 3 not shown).



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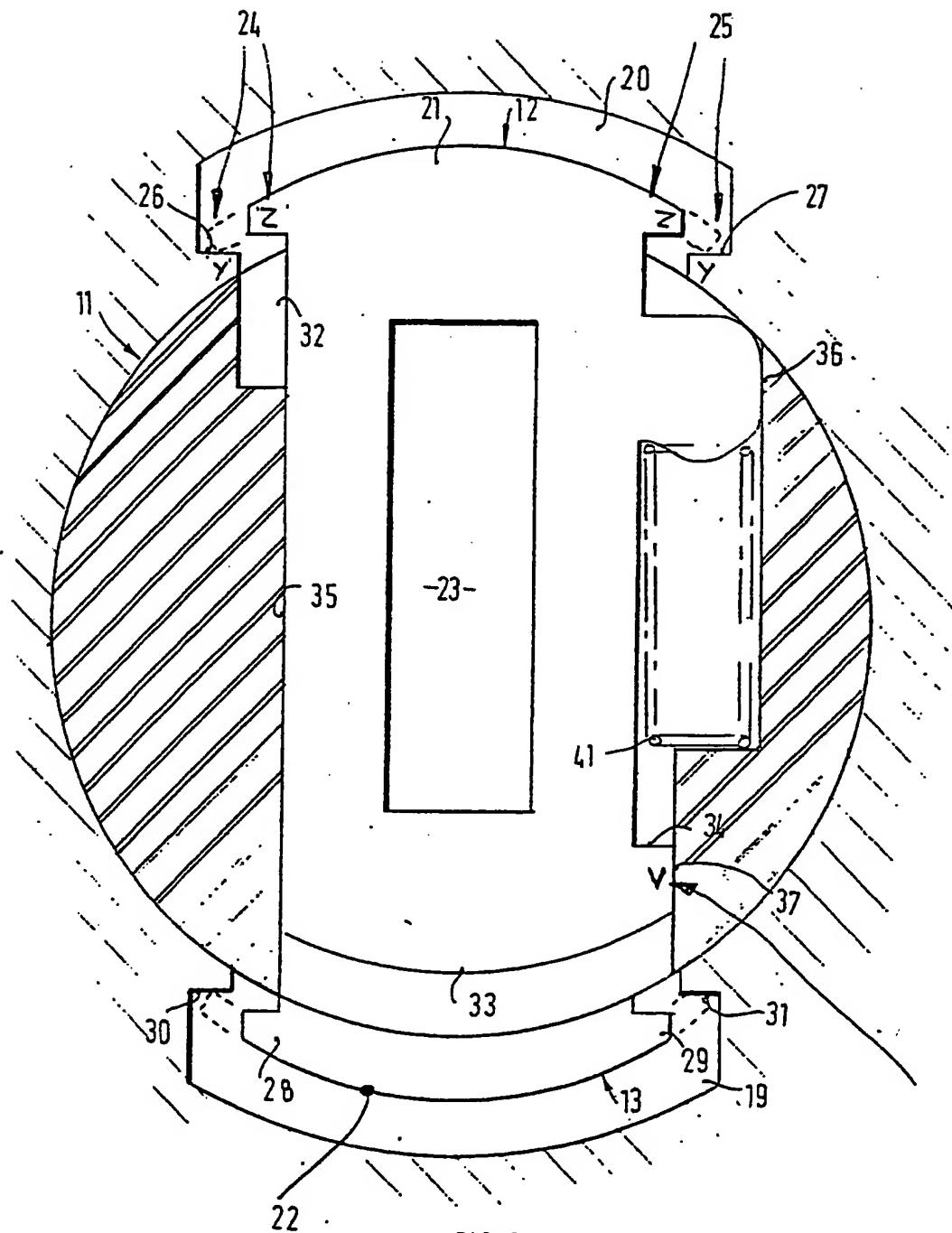


FIG. 2

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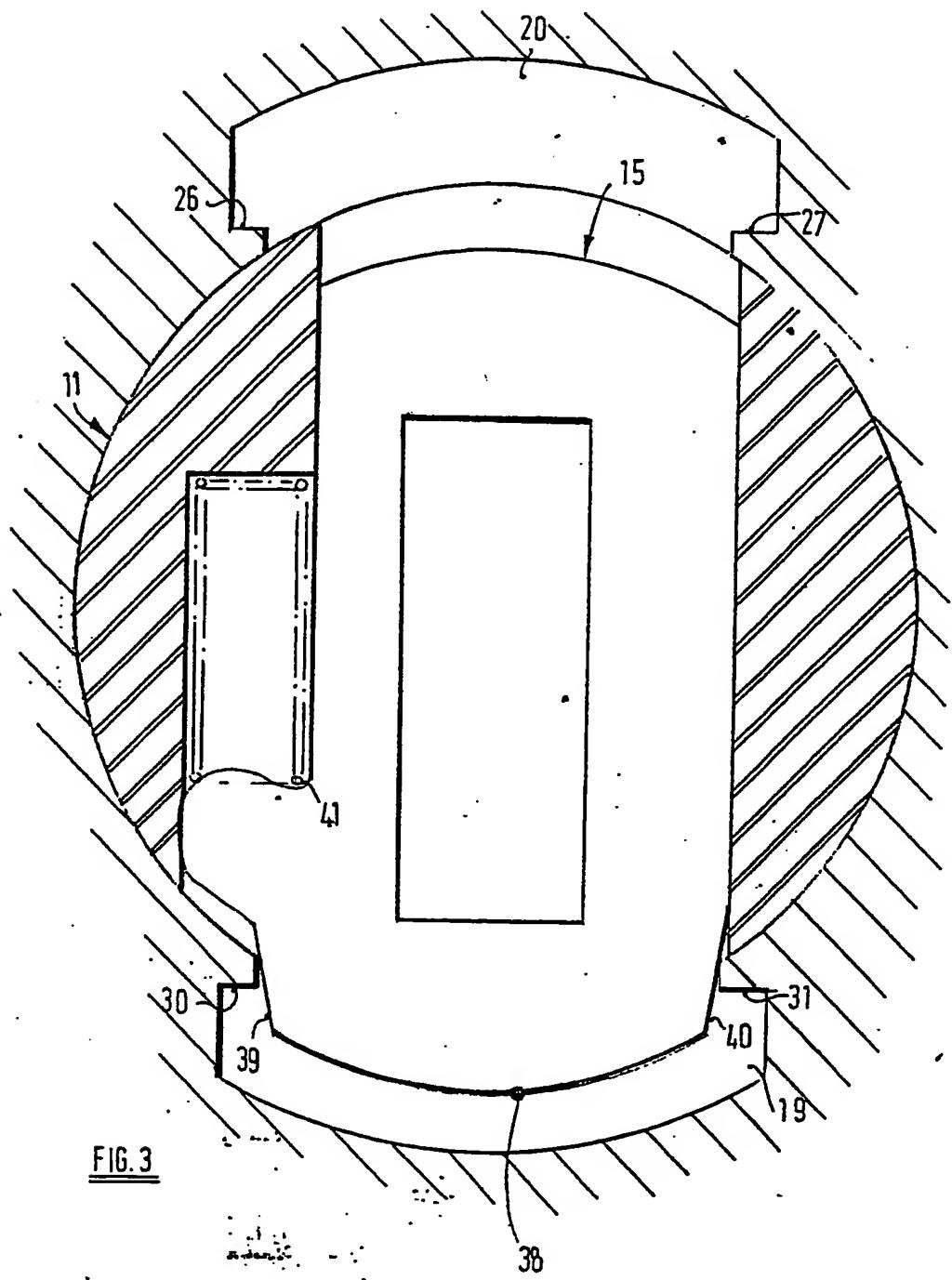


FIG. 3

SPECIFICATION

Plate tumbler lock

5 THIS INVENTION relates to a plate tumbler lock. A plate tumbler lock has a key receiving member, a further member called herein a tumbler housing and at least one tumbler, usually of plate-like form mounted in the key-receiving member for movement relative thereto between a locking position and a releasing position and biased towards the locking position. When the proper key is applied to the lock, it moves the or each tumbler to the releasing position and relative movement of the key receiving member and tumblers housing can then occur. In the locking position, a first part of the tumbler is disposed within the key receiving member and a second part 15 projects from the key receiving member and engages in a recess in the tumbler housing. Engagement of the second part of the tumbler with a boundary of the recess restricts relative movement of the key receiving member and tumbler housing when the tumbler is in its locking position. When the tumbler is in its releasing position it cannot engage the boundary of the recess. Tumblers which are commonly referred to as disc tumblers are examples of plate tumblers.

According to the present invention, there is provided a plate tumbler comprising a tumbler provided with means for engaging with the tumbler housing in a manner to obstruct movement of the tumbler from its locking position to its releasing position when, with the tumbler in its locking position, there is applied to the lock a force which tends to bring about said relative movement of the key receiving member and tumbler housing.

This arrangement makes the lock relatively difficult to pick.

There is preferably provided on the tumbler housing a surface which extends along a boundary of said recess, is transverse to the direction of movement of the tumbler from its locking position to its releasing position and faces generally in a direction away from the key receiving member, said means on the tumbler being engageable with said surface.

If, with the tumbler in its locking position, there is applied to the lock a force which tends to bring about said relative movement, there occurs sufficient relative movement to bring said means on the tumbler into overlying relation with said surface of the tumbler housing, so that movement of the tumbler to its releasing position is prevented unless the relative movement of the key receiving member and tumbler housing is reversed.

The lock may further comprise a tumbler (called herein a locating tumbler) which, when in its locking position, engages concurrently with opposite boundaries of a recess in the tumbler housing, which boundaries are

spaced apart in the direction of relative movement of the key receiving member and tumbler housing.

The locating tumbler is capable of establishing a predetermined relative position of the key receiving member and tumbler housing and of maintaining this relative position whilst the locating tumbler remains in its locking position. Whilst the predetermined relative position is maintained, the other tumbler or tumblers is or are freely movable between the locking and releasing positions.

The key receiving member is preferably rotatable relative to the housing about an axis. For convenience, a rotatable key receiving member is called in the art and herein a barrel.

The tumbler housing is preferably of tubular form and surrounds the barrel.

85 The recess may be a groove formed in an internal surface of the tumbler housing. The groove may be rectilinear with its length parallel to the axis of the barrel.

In the preferred construction, there are provided two grooves at diametrically opposite positions in the tumbler housing.

The relation between the dimensions of the recesses in the tumbler housing and the dimensions of the second parts of the tumblers

95 may be such that all of the tumblers do not engage boundaries of respective recesses in the same relative position of the key receiving member and tumblers housing. If the relative position of the key receiving member and the 100 tumbler housing has to be different to engage different tumblers with the tumbler housing in a manner to retain each tumbler in its releasing position, the difficulty of picking the lock is increased.

105 Preferably, two of said surfaces are provided on the tumbler housing along opposite boundaries of a recess, said means on the tumbler including a pair of lugs projecting one from each of two opposite margins of the

110 tumbler.

The lock may comprise a group of tumblers which are movable through the barrel from locking positions through releasing positions to respective third positions in which an end

115 portion of the first part of each tumbler projects from the barrel and said end portion is provided with means for engaging the tumbler housing in a manner to obstruct movement of the tumbler from its third position to its releasing position when, with the tumbler in its third position, there is applied to the lock a force which tends to bring about said relative movement of the barrel and tumbler housing.

Said means on the end portion may be operative to obstruct movement of the tumbler from its third position to its releasing position when the relative position of the barrel and tumbler housing is such that said means of the first part of the tumbler cannot engage a boundary of the associated recess in

the tumbler housing.

The lock preferably comprises a plurality of tumblers with which the key engages successively during insertion of the key into the key receiving member, the locating tumbler being the last tumbler to be engaged during insertion.

One example of a lock embodying the invention will now be described with reference

10 to the accompanying drawings wherein:—

Figure 1 shows a perspective view of a tumbler housing and barrel of a lock separated from each other, tumblers of the barrel being shown in respective locking positions,

15 *Figure 2* is a fragmentary cross section of the assembled lock in a plane perpendicular to an axis of rotation of the barrel, and

Figure 3 shows a further fragmentary cross section in a plane parallel to that of *Fig. 2*.

20 The lock shown in the accompanying drawings is a plate tumbler lock comprising a tumbler housing 10 and a barrel 11 containing a plurality of tumblers. In the particular example illustrated, there are four tumblers identified by the reference numerals 12 to 15. In use, the tumbler housing 10 would be rigidly secured in a body of a device to be controlled by the lock. When the proper key (not shown) is inserting into a key receiving

30 slot 16 of the barrel, the barrel is rotatable relative to the tumbler housing about an axis 17. The barrel is provided with a cam or other driving means (not shown) for driving a driven member of the device which is to be controlled by the lock. The tumbler housing 10 is of tubular form and surrounds the major part of the barrel 11. The barrel further includes a head 18 which lies outside the tumbler housing and adjacent to one end face thereof. The

35 head has a larger diameter than does the internal surface of the tumbler housing and so prevents movement of the barrel along the axis 17 in one direction. Means (not shown) would normally be provided for preventing 40 movement of the barrel in the opposite barrel in the opposite direction along the axis relative to the tumbler housing. Each of the tumblers 12 to 15 is slidably mounted in a respective slot provided in that part of the

45 barrel which is disposed within the tumbler housing. Each of these slots extends completely through the barrel so that either end portion of each tumbler can project radially from the barrel. The length of each tumbler is

50 equal to the diameter of the corresponding portion of the barrel so that each tumbler can be received entirely within the barrel. Within the barrel there is provided for each tumbler a respective spring 41 for urging the tumblers towards the locking positions shown in the drawings. When the tumblers are in the locking positions, end portions of the tumblers 12 and 14 project from the barrel at one side thereof and end portions of the tumblers 13

55 and 15 project from the opposite side of the

barrel.

The tumbler housing 10 is formed at its internal surface with recesses for receiving end portions of the tumblers which project 70 from the barrel. The recesses are constituted by a pair of rectilinear grooves which lie at diametrically opposite positions and are arranged with their respective lengths parallel to the axis 17.

75 As shown in *Fig. 2*, when the tumbler 12 is in its locking position, an end portion 21 of the tumbler is disposed within the groove 20. If an attempt is made to turn the barrel 11 about the axis 17, the end portion 21 abuts a

80 boundary of the groove 20 and limits rotation. Similarly, an end portion 22 of the tumbler 13 lies in the groove 19 and limits rotation of the barrel whilst that tumbler is in its locking position. When the key is inserted into the 85 slot 16, it passes through an aperture 23 in the tumbler 12 and through corresponding apertures in the other tumblers. The key engages with boundaries of these apertures to displace the tumblers to releasing positions in 90 which the end portions are withdrawn from the grooves 19 and 20 and the tumblers lie entirely within the barrel. The barrel is then free to be rotated by means of the key.

On the end portion 21 of the tumbler 12, 95 there are provided means for engaging with the tumbler housing 10 to obstruct movement of the tumbler from its locking position to its releasing position if an attempt is made to turn the barrel whilst the tumbler is still in its 100 locking position. This means comprises a pair of lugs 24 and 25 which project for opposite margins of the tumbler generally in directions which extend circumferentially of the barrel.

The sides of the groove 20 are undercut to 105 provide along opposite boundaries of the groove flat surfaces 26 and 27 respectively which are transverse to the direction of movement of the tumbler between its locking and releasing positions and face generally away

110 from the barrel 11. The surfaces 26 and 27 are slightly nearer to the axis 17 than are the lugs 24 and 25 so that by turning the barrel about the axis 17 with the tumbler in its locking position, the lug 24 can be moved

115 into overlying relation with the surface 26 or the lug 25 can be moved into overlying relation with the surface 27. In these overlying relations, the lugs prevent movement of the tumbler from its locking position to its 120 releasing position.

The end portion 22 of the tumbler 13 is provided with lugs 28 and 29 corresponding to lugs 24 and 25 and the groove 19 is undercut to provide surfaces 30 and 31 corresponding to the surfaces 26 and 27.

The slot in the barrel 11 which contains the tumbler 12 includes a clearance space 32 for receiving the lug 24 when the tumbler moves to its releasing position. The clearance space 130 32 extends sufficiently far into the barrel to

permit the tumbler to move to a third position (not illustrated) in which an opposite end portion 33 of the tumbler projects from the barrel into the groove 19. On the end portion 5 33, there is provided a shoulder 34 situated adjacent to one edge of the tumbler and facing towards the lug 25. In the end portion 33 is moved as far as possible into the groove 19, and torque is then applied to the barrel to 10 rotate same in a direction to operate the controlled device, there occurs sufficient rotation of the barrel to move the shoulder 34 into overlying relation with the surface 31. Engagement between the shoulder and the 15 tumbler housing then prevents return of the tumbler from its third position to its releasing position.

Angular movement of the barrel 11 from the normal position illustrated in Figs. 2 and 20 3 which is necessary to establish overlap of the shoulder 34 with the surface 31 is less than the angular movement which is necessary to establish overlap between the lug 24 and the internal surface of the tumbler housing along one margin of the groove 20. If, 25 after an overlapping relation has been established between the shoulder 24 and the surface 31, the barrel is returned towards the position illustrated in the drawing, the tumbler 30 will return to its locking position immediately the shoulder 34 moves out of engagement with the surface 31.

The tumbler 12 is guided for movement between its locking and releasing positions by 35 co-operation between edges 35, 36 and 37 of the tumbler. Angular movement of the tumbler about the axis 17 relative to the barrel is thereby substantially prevented. When the tumblers 12 to 14 are in their locking positions, angular movement of the barrel relative to the tumbler housing is restricted but not entirely prevented. The tumbler 15 has a form different from that of the tumblers 12, 13 and 40 14 and is a locating tumbler. This locating 45 tumbler is adapted to establish a predetermined rotational position of the barrel relative to the tumbler housing when the key is absent. The end portion 38 of the tumbler 15 which projects from the barrel into the groove 50 19 when the tumbler is in its locking position has a tapered form, the width of the end portion decreasing towards the end of the tumbler. When the tumbler 15 is in its locking position, opposite mutually inclined margins 39 and 40 of the end portion 38 engage opposite boundaries of the groove 19 at the mouth of the groove. Such engagement establishes the predetermined position of the barrel shown in Figs. 2 and 3.

55 60 Of the tumblers 12 to 15, the locating tumbler 15 is the one furthest from the head 18 of the barrel. When the key is inserted into the slot 16, it engages first with the tumbler 12 then successively with the tumblers 13 and 14 and finally with the tumbler 15.

Whilst the key is displacing the tumblers 12 to 14 to their releasing positions, the tumbler 15 remains in its locking position and maintains the predetermined rotational position of 70 the barrel so that the lugs 24 and 25 are maintained clear of boundaries of the groove 20. During withdrawal of the key, the first tumbler to move into its locking position is the locating tumbler 15 which then establishes 75 the predetermined rotational position of the barrel so that when the remaining tumblers are released for movement to their locking positions, such movement will not be impeded by engagement of the lugs with the 80 tumbler housing.

The width of the end portion 38 at the end of the tumbler is considerably less than the width of the mouth of the recess 19. The angular movement of the barrel which is necessary to enable the end portion 38 to be engaged with the internal surface of the tumbler housing adjacent to the mouth of the groove 19 is sufficient to establish an overlapping relation either between the lug 24 and the 90 surface 26 or between the lug 25 and the surface 27. Although a person attempting to pick the lock may be able to move the tumbler 15 into its releasing position (by inserting a tool into the slot 16) and then retain the 95 tumbler 15 in its releasing position by turning the barrel sufficiently to engage the end portion 38 with the internal surface of the tumbler housing, such turning will have established an overlapping relation between one or 100 other of the lugs 24 and 25 and the corresponding surface 26 or 27 so that subsequent movement of the tumbler 12 to its releasing position will be prevented unless the barrel is returned towards the predetermined position.

105 Return of the barrel towards its predetermined position would release the tumbler 15 for movement once more to its locking position.

CLAIMS

110 1. A plate tumbler lock comprising a tumbler provided with means for engaging with the tumbler housing in a manner to obstruct movement of the tumbler from its locking position to its releasing position when, with 115 the tumbler in its locking position, there is applied to the lock a force which tends to bring about said relative movement of the key receiving member and tumbler housing.

2. A lock according to Claim 1 wherein 120 there is provided on the tumbler housing a surface which extends along a boundary of said recess and faces generally in a direction away from the key receiving member, said means on the tumbler being engageable with 125 said surface.

3. A lock according to Claim 1 or Claim 2 further comprising a locating tumbler which, when in its locking position, engages the tumbler housing to establish a predetermined 130 relative position of the key receiving member

and tumbler housing.

4. A lock according to any preceding claim wherein the key receiving member is rotatable relative to the tumbler housing about

5 an axis.

5. A lock according to Claim 4 wherein the tumbler housing is of tubular form and surrounds the barrel and wherein the recess is an axially extending groove formed in an

10 internal surface of the tumbler housing.

6. A lock according to Claim 5 wherein there are provided two grooves at diametrically opposite positions in the tumbler housing.

15 7. A lock according to any preceding claim comprising a plurality of tumblers and wherein the relation between the dimensions of second parts of the tumblers and the dimensions of recesses in which the second 20 parts engage are such that all of the tumblers do not engage boundaries of respective recesses in the same relative position of the key receiving member and tumbler housing.

8. A lock according to any one of Claims 25 1 to 6 comprising a group of tumblers which are movable through the barrel from locking positions through releasing positions to respective third positions in which an end portion of the first part of each tumbler projects 30 from the barrel and wherein said end portion is provided with means for engaging the tumbler housing in a manner to obstruct movement of the tumbler from its third position to its releasing position, when with the tumbler 35 in its third position, there is applied to the lock a force which tends to bring about said relative movement of the barrel and tumbler housing.

9. A lock according to Claim 3 having a 40 plurality of tumblers with which the key engages successively during insertion of the key into the key receiving member and wherein the locating tumbler is the last tumbler to be engaged during insertion.

45 10. A plate tumbler lock substantially as herein described with reference to and as shown in the accompanying drawings.

11. Any novel feature or novel combination of features disclosed herein or in the 50 accompanying drawings.